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felted saddle in which the basioccipital rests, which branches curve upwards and press against the bases of the rear horn-cores, so-called, and hold all firmly in place. The front iron has a small square button on top, felted, on which the roof of the mouth rests. These irons weigh four pounds.

While it is of course impossible to fix a maximum for the size of pedestals, a minimum is a good thing to have, and I have fixed on 3 in. \times 1½ in. \times 1 in. high. This gives room for a good sized label on the side, giving genus and species, geological formation, locality and catalogue number.

For very small jaws, single small teeth, &c., I set up a small cylinder of plaster on one of the smallest pedestals, and cement the specimen to the top of it. In other cases, as in *Didelphys pygmæa* Scott, and the Aciprion jaws shown in Fig. 8, the slab of matrix is cemented to the surface of a board hung on two pivots, so that it can be tilted to either side for examination. And when a new specimen shows new features I devise a new mounting to suit them.

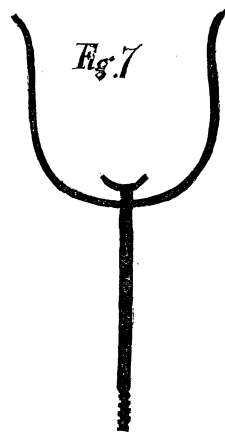


Fig. 8

3 PEDESTAL
IN LONG

—:O:—

RECENT LITERATURE.

CROLL'S CLIMATE AND COSMOLOGY.¹—In this volume of essays, Mr. Croll reaffirms his physical theory to account for the glacial climate in a way to command the attention of every geologist and in a manner which will attract the interest of the lay reader. The discussions relate to questions of the deepest interest, and the arguments used are certainly strong ones. Mr. Croll's peculiar views as to the existence of glacial climates before the Quaternary period are restated with much fullness, though he candidly admits that most geologists are opposed to them.

The author's theory is usually called the "eccentricity theory," but he prefers to call it the "physical theory." He states that a high state of eccentricity of the earth's orbits will not necessarily

¹ *Discussions on Climate and Cosmology.* By JAMES CROLL, LL.D., F.R.S. New York, D. Appleton & Co., 1886. 12mo, pp. 327. \$2.

alone produce a glacial epoch, but that from the first he has "maintained that no amount of eccentricity, however great, could alone produce a glacial condition of things," but that "the glacial epoch was the result, not of a high state of eccentricity, but of a combination of physical agencies, brought into operation by this high state" of eccentricity. One of the most important of these agencies is, he thinks, the enormous amount of heat conveyed from equatorial to temperate and polar regions by means of ocean currents, and the deflection of this heat, during a high state of eccentricity, from the one hemisphere to the other. But all this depends on ocean-currents flowing from equatorial to polar regions, and the existence of these currents, in turn, depends, to a large extent, on the contour of the continents and the particular distribution of sea and land. Take, as one example, the Gulf stream, a current which played so important a part in the phenomena of the glacial epoch. A very slight change in geographical conditions, such as the opening of communication between the Gulf of Mexico and the Pacific, would have greatly diminished, if not entirely destroyed, that stream; or, as I showed on a former occasion, a change in the form or contour of the Northeast corner of the South American continent would have deflected the great equatorial current, the feeder of the Gulf stream, into the Southern ocean and away from the Caribbean sea. One of the main causes of the extreme condition of things in Northwestern Europe, as well as in eastern parts of America during the glacial epoch, was a large withdrawal of the warm waters of the Gulf stream, and this was to a great extent due, as I stated in my first paper on the subject,¹ to the position of Cape St. Rogue, which deflected the equatorial current into the Southern ocean. That a geographical distribution of land and water, permitting of the existence and deflection of those heat-bearing currents, is one of the main factors in my theory, is what must be obvious to every reader of *Climate and Time*."

Dr. Croll maintains that, with the exception of those resulting from oscillations of sea level, the general distribution of sea and land and other geographical conditions were the same during the glacial epoch as they are at present. Thus he does not accept Lyell's theory of an elevation of northern lands; yet we do not see but that this was a matter of fact. Indeed, Mr. Croll's speculations produce the impression that he is somewhat one-sided in his treatment of these theories. His knowledge of general geology, and especially of palæontology, is apparently slight. For as regards his theory of interglacial climates in times preceding the Quaternary, the view is opposed to the whole mass of facts in palæontology. The more we have read of Dr. Croll's eccentricity theory, the less necessary does it seem; the geologist had better

¹ *Philos. Mag.* for August, 1864.

rely on purely geological causes; they may yet be proved to have been sufficient. Dr. Croll nowhere explains why so large a portion of the subpolar regions were unglaciated.

In his discussions in cosmology, Dr. Croll contends that Sir William Thomson and others are wrong in maintaining the "gravitation theory," *i. e.*, that the sun cannot have supplied the earth with heat, even at the present rate, for more than about 15 to 20,000,000 years. He discards this theory, and freely gives the evolutionists and geologists all the heat they want, by claiming that the sun's heat was originally derived from motion in space; this being "more in harmony with the principles of evolution than the gravitation theory, because it explains how the enormous amount of energy which is being dissipated into stellar space may have existed in the matter composing the sun untransformed during bygone ages, or, in fact, for as far back as the matter itself existed."

On page 65, Dr. Croll, it seems to us, too hastily assumes that the ice in the interior of Greenland is of great thickness, while the land itself is low, "probably not much above sea-level." On the contrary, as the result of recent Danish exploration, Dr. Rink tells us, the surface of the ice in the interior is 6000 feet above the sea, while we infer from his statements that the thickness of the ice is not much over 2000 feet. In fact, the theoretical glacialists go to extremes; closet speculations and field-work do not always harmonize.

The only typographical errors we have noticed are the mention of "Heyes" for Hayes on one occasion, while Torell is wrongly spelt "Torrell," in the only instance in which it is used.

LEUNIS' SYNOPSIS DER THIERKUNDE.¹—This is a new edition of Leunis' Zoölogy, which for so many years has been in almost universal use in the German gymnasias and many of the universities. The present work contains two large volumes of more than 1200 closely printed pages and 1000 cuts each. Perhaps the greatest advantage of Leunis' system was that by the use of series of analytical keys animals could be determined much as the student analyzes flowers with Gray's Botany. This alone would render the book invaluable to any one who wishes to begin the study of a new group or to determine quickly an animal belonging to an unfamiliar class. The book is, of course, intended for German students, but is also quite complete for the marine invertebrates of the North, Baltic and Mediterranean seas. But it contains representative species of most of our American genera. Professor Ludwig, whose work on Echinoderms is known by all zoölogists, has revised the edition and has completely rewritten the second volume, which treats of the inverte-

¹ Third edition, revised by Professor LUDWIG, of Giessen.